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WRITTEN BY : J. BOURQUIN

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TEMPERATURE MEASUREMENT IN THE MEAINSTREM SMOKE OF CIGARETTES

At the request of PM-Munich (1), the mainstream smoke temperature of two cigarettes, MARLBORO KS and PM MULTI 100 (Munich) was measured in order to ascertain an eventual difference between these two brands.

The cigarettes were smoked on a twenty port rotary machine RM 20/CS. A Chromal-Alumel thermocouple, made of wires of 0.2 mm diameter, was placed in the machine head so that it layed 5 mm behind the cigarette tip. A second thermocouple was maintained as a reference at room temperature. The thermocouple voltage was recorded during the whole smoking process (i.e.  $\Delta t$  : the difference between smoke and ambiant temperature). Each brand was smoked twice, and the puffs were drawn until the tipping paper was reached.

The results of the experiments are given in Table I where each value of temperature represents the mean of twenty puffs, with its relative standard deviation. The values are reported graphically in Fig. 1.

The two sets of values of MARLBORO KS were reported individually, because a slight difference in the puff count (about half a puff) has fortunately allowed to refine the measuring in the interesting zone of rising temperature. The values for the PM MULTI 100 represent the average of the two smoking runs.

Table I : Mainstream Smoke Temperature of MARLBORO KS  
and PM MULTI 100 (Munich)

Puff No.	MARLBORO KS				PM MULTI 100					
	a)		b)		a)		b)		average	
	$\Delta t$ °C	S	$\Delta t$	S	$\Delta t$	S	$\Delta t$	S	$\Delta t$	S
1	0.9	0.1	0.8	0.3	0.3	0.2	0.3	0.3	0.3	0.2
2	0.8	0.1	0.9	0.1	0.8	0.1	0.8	0.2	0.8	0.2
3	1.1	0.1	1.2	0.1	1.1	0.1	1.1	0.1	1.1	0.1
4	1.3	0.1	1.3	0.1	1.3	0.1	1.3	0.1	1.3	0.1
5	1.7	0.1	1.7	0.1	1.5	0.1	1.5	0.1	1.5	0.1
6	2.2	0.2	2.2	0.2	1.7	0.2	1.7	0.1	1.7	0.1
7	3.4	0.6	3.3	0.5	1.9	0.2	1.9	0.1	1.9	0.1
8	16.0	10.3	7.4	2.0	2.4	0.2	2.3	0.2	2.4	0.2
9	44.2	4.9	38.6	4.5	3.8	0.5	3.6	0.6	3.7	0.6
10	--	--	46.2	3.1	11.4	4.6	12.4	5.2	11.9	4.9
11	--	--	--	--	43.3	5.9	41.5	7.1	42.4	6.5

CONCLUSION:

- The temperature of the mainstream smoke is practically constant during the 7 (for Marlboro KS) and 8 (for PM-Multi) first puffs, and is only slightly higher than the ambient temperature (less than 4° C).
- As the burning zone comes near the filter, the temperature rises, and the difference between the two brands becomes significant, reaching the maximum value of 27° C at about 6 mm from the tipping paper, i.e. during the last "standard" puff.

REFERENCE

- (1) Verbal request of Mr. Föckler, PM Munich, to M. Häusermann of May 1980.

J. Bourquin

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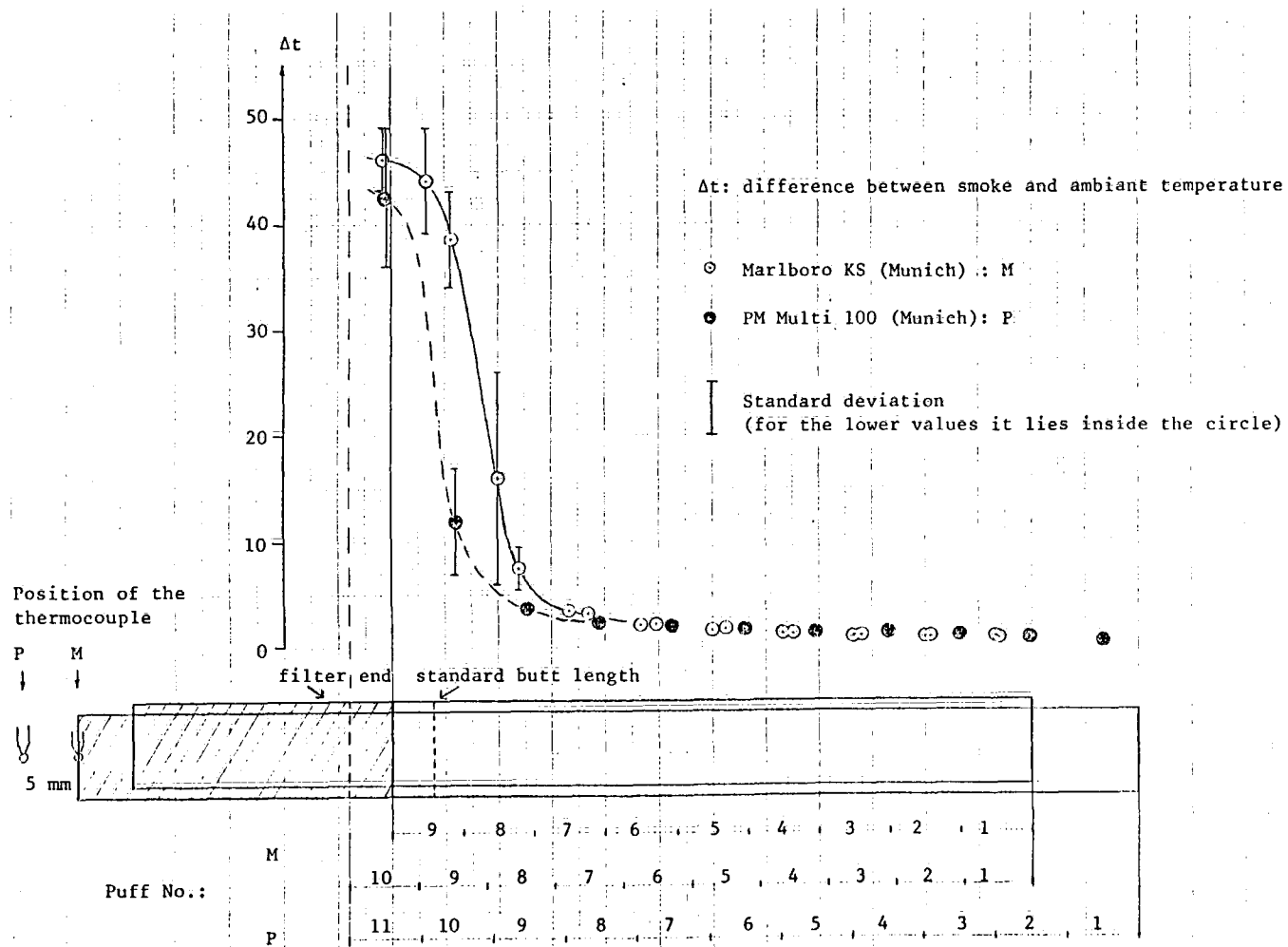


Fig. 1.: Smoke temperature as a function of the burning zone position.